STAR-FORMING GALAXIES IN THE 2DFGRS

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Abstract We examine the environment of star-forming galaxies selected in the 2dFGRS. We find that bright star-forming galaxies display a significant deficit of faint neighbours relative to passive galaxies. If a deficit in fainter companions implies a smaller mass halo, data support a scenario predicting star-formation to be suppressed in all systems more massive than 10^{13}M$_{\odot}$, rather than in clusters only.

1. Introduction

Data from the 2dFGRS (Lewis et al. 2002) and the SDSS (Gomez et al. 2003, Hogg et al. 2003) indicate that there is a deficit of star-forming galaxies in dense regions. Direct evidence of star-formation suppression in regions less extreme than rich clusters remains, however, controversial (Carlberg et al. 2001, Bower & Balogh 2003). To explore whether the suppression of star-forming activity and the local number of neighbours are related, we analyse the environment of star-forming and passive galaxies in the 2dFGRS (type 3+4 and type 1 respectively as in Madgwick et al. 2002). The sample includes all 10695 galaxies in the redshift range [0.0005-0.25] with b_j between 17 and 17.5. For each galaxy we have automatically identified neighbours, i.e. galaxies lying within an area of $1h^{-1}$Mpc radius (computed at the redshift of the galaxy) and Δcz $\pm$1000 km s^{-1}. Because the 2dFGRS is complete for b$_j \in$ [17 - 19.5] we identify all neighbours from equally-luminous to $\sim$2-mag-fainter.

2. Faint and equally luminous neighbours

The average number of neighbours of 2dF galaxies, averaged in bins of absolute magnitude, is shown in Fig.1. The average for all galaxies (empty circles) and for passive (squares) and star-forming (triangles) subsamples are plotted. The left panel shows the average when counting neighbours whose luminosity is $\approx$ equal ($|\Delta$b$_j| \leq$0.5) to the one of the galaxy itself while the right one shows the average when counting much fainter neighbours (1.5$\leq \Delta$b$_j \leq$2.5). Fig. 1 shows that star-forming galaxies inhabit regions which are less dense

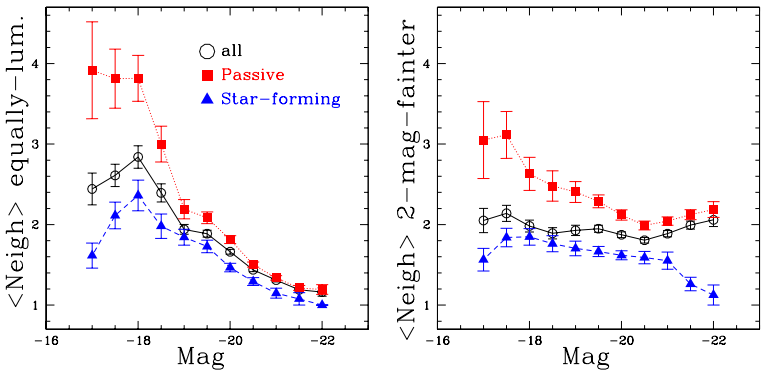

Figure 1. Average number of equally-luminous (left) and fainter (right) neighbours

than passive galaxies. However, while fainter galaxies segregate in both panels, bright galaxies only segregate when faint neighbours are counted. The right panel indicates that among the brightest galaxies (Mag$\leq$-20), only passive galaxies display an increasingly excess of faint neighbours. The difference in the number of faint neighbours might trace a difference in the mass of the halos hosting bright passive and bright star-forming galaxies (Magliocchetti & Porciani 2003). Star-forming galaxies might be in a small mass halos where the cooling gas is channeled to one or two galaxies, while passive galaxies might be in more massive halos (M$>10^{13}$M$_{\odot}$) which are accreating smaller ones, and whose pre-existing galaxies survive as distinct entities(Berlind et al. 2003). To assess that the lack of faint neighbours around bright star-forming galaxies indicates that they reside in smaller mass systems also matches observations indicating that diffuse X-emission is restricted to groups with a dominant E-S0 (Mulchaey et al. 2003, Helsdon et al. 2001). Observations are thus supporting the hyphothesis that star-formation is suppressed in bright galaxies residing in any group more massive than 10^{13}M$_{\odot}$, rather than in clusters only.

References

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